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10/593,848	08/06/2007	Chang-Hee Lee	5489.P092	4444

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EXAMINER	
JACOB, OOMMEN	

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2613	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/593,848	LEE ET AL.	
	Examiner	Art Unit	
	OOMMEN JACOB	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _21 September 2006_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-22_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-22_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _21 September 2006_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1 and 4-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tervonen [WO 03/055111].

Tervonen teaches a wavelength division multiplexing passive optical network (WDM- PON) for performing bi-directional communication, the WDM-PON comprising:

two or more remote distribution nodes in between a central office and a first optical network unit (Tervonen Fig 5 item 511-512 are remote nodes in between Hub and ONUs), and a first remote distribution node has two or more optical network units connected to the first remote distribution node (Tervonen Fig 5 items 514, 516, 518 and 519 are ONUs connected to first remote distribution unit item 521), wherein each remote distribution node separates one or more wavelength channels from a composite optical signal distributed through that remote distribution node (Tervonen Fig 5 item 521 $\lambda 1$, $\lambda 3$ from downstream wavelength band consisting of $\lambda 1$- $\lambda 4$, and item 511 separates $\lambda 1$ from $\lambda 1$ and $\lambda 3$ in downstream direction).

Tervonen specification page 11 lines 29-30 teaches that the interleavers and multiplexers are installed in a 'curb location'. However lines 30-31 disclose that these need not be in the same location. At the time of invention it would have been obvious to a person of skill in the art to place the second distribution node, in a location depending on factors like customer locations and cost effectiveness.

<u>As per Claim 4</u>

Tervonen further teaches a second remote distribution node containing a first multiplexer/demultiplexer to receive a first subset of the wavelength channels in a first composite optical signal from the first remote distribution node (Tervonen Fig 5 item 511 and 512 comprise the second distribution node. Item 511 receives first subset signals with wavelengths λ1 and λ3 from first composite signal comprising wavelengths λ1- λ4) and to send a first portion of wavelength channels in a second composite optical signal to the first remote distribution node (Tervonen Fig 5 item 511 sends channels λ2 and λ4 to first distribution node 521. Second composite optical channel, from second distribution node to item 521 also comprises wavelengths λ1- λ4),

Tervonen is different from the instant Claim in that, Tervonen does not teach teaches different wavelength bands for upstream (second composite signal) and downstream (first composite signal) communication between hub and first distribution node. Instead Tervonen uses same wavelength bands of λ1- λ4 for both upstream (second composite signal) and downstream (first composite signal) communication between hub and first distribution node. This is because Tervonen uses unidirectional fibers for communication between hub and first distribution node. Tervonen also

employs different wavelength bands in bidirectional fibers between first and second distribution units. At the time of invention it would have been obvious to a person of ordinary skill in the art to use wavelengths of different bandwidths for upstream and downstream signals between the hub and first node if a bidirectional fiber was used, to reduce cross talk and back-reflections (Tervonen Specification page 6 lines 24-27).

As per Claim 5

Tervonen further teaches wherein the second remote distribution node also contains a second multiplexer/demultiplexer (Tervonen Fig 5 item 513) to receive a second subset of the wavelength channels in the first composite optical signal from the first remote distribution node (Tervonen Fig 5 item 512 receives second subset with wavelengths $\lambda 2$ and $\lambda 4$) and to send a second subset of wavelength channels from the second wavelength band to the first remote distribution node (Tervonen Fig 5 item 512 sends a second subset with wavelengths $\lambda 2$ and $\lambda 4$ to the first distribution node).

As per Claim 6

Tervonen further teaches a first remote distribution node having an optical interleaver configured to split a first composite optical signal in a first wavelength band into a first portion consisting of odd numbered wavelength channels and a second portion consisting of odd numbered wavelength channels (Tervonen Fig 5 item 521 splits received signals from Hub into odd and even numbered wavelengths).

As per Claim 7

Tervonen further teaches wherein the optical interleaver is also configured to create a second composite optical signal in a second wavelength band from a

combination of a first portion of wavelength channels in the second wavelength band and a second portion of wavelength channels in the second wavelength band (Tervonen Fig 5 item 521 combines odd and even numbered channels from items 511 and 513 to create a composite signal with wavelengths comprising λ1- λ4).

As per Claim 8

Tervonen further teaches wherein the first remote distribution node includes an optical interleaver to receiving a downstream optical signal from the central office (Tervonen Fig 5 item 521), divides the downstream signal into odd wavelength channel signals and even wavelength channel signals in order to output the odd and even wavelength signals to corresponding multiplexer/demultiplexers (Tervonen Fig 5 item 521 splits received signals from Hub into odd and even numbered wavelengths), and receives the odd and even wavelength channel signals from the corresponding multiplexer/demultiplexers in order to combine the odd wavelength channel signals with the even wavelength channel signals (Tervonen Fig 5 item 521 combines odd and even numbered channels from items 511 and 513 to create a composite signal with wavelengths comprising λ1- λ4).

As per Claim 9

Tervonen further teaches a second remote distribution node containing a first multiplexer/demultiplexer to receive the odd numbered wavelength channels from the first remote distribution node (Tervonen Fig 5 item 511 receives odd numbered wavelengths from item 521) and to send the first portion of the wavelength channels in a second wavelength band to the first remote distribution node (Tervonen Fig 5 item 511

sends wavelengths λ2 and λ4 to the first distribution node. This is the first portion of channels in a second wavelength band λ1- λ4).

As per Claim 10

Tervonen further teaches wherein the second remote distribution node also containing a second multiplexer/demultiplexer to receive the even numbered wavelength channels of the first wavelength band from the first remote distribution node (Tervonen Fig 5 item 511 receives odd numbered wavelengths from item 521) and to send a portion of the second wavelength band to the first remote distribution node (Tervonen Fig 5 item 513 sends wavelengths λ1 and λ3 to the first distribution node. This is the second portion of channels in a second wavelength band λ1- λ4).

2. Claims 2-3 and 11-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tervonen [WO 03/055111], in view of Liu [US PUB NO: 2001/0038479].

As per Claim 2

Tervonen further teaches a first remote distribution node configured to split a first composite optical signal that includes all of the wavelength channels in a first wavelength band into a first subset of the wavelength channels and a second subset of the wavelength channels (Tervonen Fig 5 item 5 is configured to split the incoming wavelength band λ1- λ4, into subsets λ1, λ3 and λ2, λ4).

Tervonen does not teach the first node having a series of band splitting filters.

Liu teaches having a series of band splitting filters to be implemented in a node (Liu Fig 7 shows sequentially separating the incoming signal into subsets using series of filters).

At the time of invention it would have been obvious to a person of ordinary skill in the art to use the arrangement disclosed in Liu to perform the interleaving functions taught in Tervonen, by sequentially separating channels from first signal.

As per Claim 3

Tervonen in view of Liu further teaches wherein the series of band splitting filters are also coupled together to create a second composite optical signal (Tervonen Fig 5 signal on fiber 522) in a second wavelength band (Tervonen Fig 5 upstream wavelength band is λ1- λ4) by combining a first portion of the wavelength channels in the second wavelength band (Tervonen Fig 5 wavelength λ2 and λ4 entering 521 on upstream side) and a second portion of the wavelength channels in the second wavelength band (λ1 and λ3 entering 521 on upstream side), wherein the second composite optical signal travels in the opposite direction of the first composite optical signal (Tervonen Fig 5 first composite signal travels downstream on fiber 520 and second composite signal travels upstream via fiber 522).

Tervonen in view of Liu is different from the instant Claim in that, they do not teach different wavelength bands for upstream (second composite signal) and downstream (first composite signal) communication between hub and first distribution node. Instead Tervonen uses same wavelength bands of λ1- λ4 for both upstream (second composite signal) and downstream (first composite signal) communication

between hub and first distribution node. This is because Tervonen uses unidirectional fibers for communication between hub and first distribution node. Tervonen also employs different wavelength bands in bidirectional fibers between first and second distribution units. At the time of invention it would have been obvious to a person of ordinary skill in the art to use wavelengths of different bandwidths for upstream and downstream signals between the hub and first node if a bidirectional fiber was used, to reduce cross talk and back-reflections (Tervonen Specification page 6 lines 24-27).

As per Claim 11

Tervonen further teaches a first remote distribution node configured to split a first composite optical signal that includes all of the wavelength channels in a first wavelength band into a first subset of the wavelength channels and a second subset of the wavelength channels (Tervonen Fig 5 item 5 is configured to split the incoming wavelength band λ1- λ4, into subsets λ1, λ3 and λ2, λ4).

Tervonen does not expressly teach having a multiplexer/demultiplexer coupled to two or more band splitting filters in the first remote distribution node.

Liu teaches having a multiplexer/demultiplexer coupled to two or more band splitting filters in the first remote distribution node (Liu Fig 5 discloses Mux and Demux coupled to series of band splitting filters).

At the time of invention it would have been obvious to a person of ordinary skill in the art to use the arrangement disclosed in Liu to perform the interleaving functions taught in Tervonen, by employing arrangement of Liu Fig 5 to provide additional add/drop functionality at the nodes.

As per Claim 12

Tervonen in view of Liu further teaches a second remote distribution node (Tervonen Fig 5 items 511 and 513) containing a first multiplexer/demultiplexer to receive the first subset of wavelength channels from the first remote distribution node (Tervonen Fig 5 item 511 receives wavelengths λ1 and λ3 from first node), a second multiplexer/demultiplexer to receive the second subset of wavelength channels from the first remote distribution node (Tervonen Fig 5 item 513 receives wavelengths λ2 and λ4 from first node).

As per Claim 13

Tervonen in view of Liu further teaches wherein the second remote distribution node to send a portions of the wavelength channels in a second wavelength band to the second multiplexer/demultiplexer in the first remote distribution node via the band splitting filters (Tervonen Fig 5 portion of wavelength band, λ2 and λ4 is sent to second multiplexer/demultiplexer), wherein the second multiplexer/demultiplexer to combine the wavelength channels from the portions (Tervonen Fig 5 combines wavelengths λ1 and λ3). Tervonen specification page 11 also discloses that in general case wavelengths range from 1 to n. N can be chosen so that the first to fourth portions are combined and separated by multiplexers and demultiplexers in the second node.

As per Claim 14

Tervonen in view of Liu further teaches a first band splitting filter to separate and couple a downstream and an upstream optical signal onto a first optical cable connected to the central office (Liu Fig 7).

As per Claim 15

Tervonen further teaches the first remote distribution node includes a first multiplexer/demultiplexer (Tervonen Fig 5 item 521) and a second remote distribution node (Tervonen Fig 5 items 511 and 513) and the first multiplexer/demultiplexer distributes two or more of the wavelength channels in the composite optical signal (Tervonen Fig 5 item 521 distributes wavelengths to the two muxes 511 and 513).

Tervonen does not teach that the first remote distribution node includes an add drop module, wherein a first drop module removes a wavelength channel from a composite optical signal that includes all of the wavelength channels.

Liu teaches an add drop module, wherein a first drop module removes a wavelength channel from a composite optical signal that includes all of the wavelength channel (Liu Fig 5 discloses add drop port for selectively removing wavelength channels).

As per Claim 16

Tervonen further teaches the first remote distribution node containing a first multiplexer/demultiplexer (Tervonen Fig 5 item 521).

Tervonen does not expressly teach two or more add/drop modules coupled to an optical fiber from the central office to the first remote distribution node, wherein the add/drop modules to remove wavelength channels from a downstream optical signal prior to the first multiplexer/demultiplexer.

Liu teaches add/drop modules that can be used in combination with WDM for adding and dropping channels (Liu Fig 5).

At the time of invention it would have been obvious to a person of ordinary skill in the art to integrate a programmable add/drop module as disclosed Liu, between the Hub and the first distribution units in Tervonen, so as to provide a method of adding/dropping channels/customers in a network, without interrupting or affecting other channels involved in the network.

As per Claim 17

Tervonen teaches a method comprising separating a first composite optical signal that includes all of the wavelength channels in a first wavelength band (Tervonen Fig 5 wavelength band λ1- λ4) in a transmission path between a central office (Tervonen Fig 5 item 521) and a most distant optical network unit (Tervonen Fig 5 item 514) into two or more smaller groups consisting of subsets of the wavelength channels (Tervonen Fig 5 item 521 separates wavelength band λ1- λ4 into smaller groups); and

Tervonen does not expressly show generating the two or more smaller groups consisting of subsets of the wavelength channels by sequentially separating the first composite optical signal along the transmission path two or more times.

Liu shows generating the two or more smaller groups consisting of subsets of the wavelength channels by sequentially separating the first composite optical signal along the transmission path two or more times (Liu Fig 7 shows sequentially separating the incoming signal into subsets).

At the time of invention it would have been obvious to a person of ordinary skill in the art to use the arrangement disclosed in Liu to perform the interleaving functions taught in Tervonen, by sequentially separating channels from fist signal.

As per Claim 18

Tervonen in view of Liu further teaches separating the composite optical signal into a first subset that includes even numbered wavelength channels (Tervonen Fig 5 downstream channels to item 513) and a second subset that includes odd numbered wavelength channels (Tervonen Fig 5 downstream channels to item 511).

As per Claim 19

Tervonen in view of Liu further teaches combining two or more optical signals in a second wavelength band along the transmission path (Tervonen Fig 5 item 521 combines wavelengths from items 511 and 513 into wavelength band λ1- λ4), each optical signal with one or more wavelength channels (Tervonen Fig 5), wherein a second composite optical signal travels in an opposite direction of the first composite optical signal (Tervonen Fig 5 signals upstream to the interleaver is combined)

Tervonen in view of Liu is different from the instant Claim in that, they do not teach different wavelength bands for upstream (second composite signal) and downstream (first composite signal) communication between hub and first distribution node. Instead Tervonen uses same wavelength bands of λ1- λ4 for both upstream (second composite signal) and downstream (first composite signal) communication between hub and first distribution node. This is because Tervonen uses unidirectional fibers for communication between hub and first distribution node. Tervonen also employs different wavelength bands in bidirectional fibers between first and second distribution units. At the time of invention it would have been obvious to a person of ordinary skill in the art to use wavelengths of different bandwidths for upstream and

downstream signals between the hub and first node if a bidirectional fiber was used, to reduce cross talk and back-reflections (Tervonen Specification page 6 lines 24-27).

As per Claim 20

Tervonen teaches an apparatus comprising a first optical network unit including an optical receiver and an optical transmitter (Tervonen Fig 5 item 514 is ONU for transmitting and receiving wavelengths λ1 and λ2); and means for separating a first composite optical signal that includes all of the wavelength channels in a first wavelength band (Tervonen Fig 5 wavelength band λ1- λ4 is separated by interleaver 521) into two or more smaller groups consisting of subsets of the wavelength channels (Tervonen Fig 5 item 521 separates wavelength band λ1- λ4 into smaller groups) in a transmission path between a central office and a first optical network unit (Tervonen Fig 5 item 521 is on transmission path between ONUs and Hub).

Tervonen does not expressly teach wherein the first composite optical signal is sequentially separated along the transmission path two or more times to generate the two or more smaller groups consisting of subsets of the wavelength channels.

Liu shows generating the two or more smaller groups consisting of subsets of the wavelength channels by sequentially separating the first composite optical signal along the transmission path two or more times (Liu Fig 7 shows sequentially separating the incoming signal into subsets).

At the time of invention it would have been obvious to a person of ordinary skill in the art to use the arrangement disclosed in Liu to perform the interleaving functions taught in Tervonen, by sequentially separating channels from first signal.

As per Claim 21

Tervonen in view of Liu further teaches means for separating the composite optical signal into a first subset that includes even numbered wavelength channels (Tervonen Fig 5 downstream channels to item 513) and a second subset that includes odd numbered wavelength channels (Tervonen Fig 5 downstream channels to item 511).

As per Claim 22

Tervonen in view of Liu further teaches means for combining two or more optical signals in a second wavelength band along the transmission path (Tervonen Fig 5 item 521 combines wavelengths from items 511 and 513 into wavelength band λ1- λ4), each optical signal with one or more wavelength channels (Tervonen Fig 5), wherein a second composite optical signal travels in an opposite direction of the first composite optical signal (Tervonen Fig 5 signals upstream to the interleaver is combined)

Tervonen in view of Liu is different from the instant Claim in that, they do not teach different wavelength bands for upstream (second composite signal) and downstream (first composite signal) communication between hub and first distribution node. Instead Tervonen uses same wavelength bands of λ1- λ4 for both upstream (second composite signal) and downstream (first composite signal) communication between hub and first distribution node. This is because Tervonen uses unidirectional fibers for communication between hub and first distribution node. Tervonen also employs different wavelength bands in bidirectional fibers between first and second distribution units. At the time of invention it would have been obvious to a person of

ordinary skill in the art to use wavelengths of different bandwidths for upstream and downstream signals between the hub and first node if a bidirectional fiber was used, to reduce cross talk and back-reflections (Tervonen Specification page 6 lines 24-27).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OOMMEN JACOB whose telephone number is (571) 270-5166. The examiner can normally be reached on Monday – Friday, 8:00 a.m. – 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, KEN VANDERPUYE can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OJ/

/Kenneth N Vanderpuye/
Supervisory Patent Examiner, Art Unit 2613